

away from the side surface of the movable weight 963. Further, during this period, since the drive signal is supplied from the oscillator 974 to the coil 962, the movable weight 963 reciprocates. As opposed to this, when application of the drive signal from the oscillator 974 to the coil 962 is stopped, application of the drive signal from the brake control circuit 975 to the brake coil 974 is also stopped. Therefore, the brake surface 971a of the brake member 971 is pushed against the side surface of the movable weight 963 and the reciprocation of the movable weight 963 is made to quickly stop. Therefore, similar effects as the first example of the present embodiment are exhibited.

[0392] [M-3: Third Example]

[0393] FIG. 75 is a sectional view illustrating the internal structure of an oscillatory actuator 975 according to a third example of this embodiment. In the figure, the oscillatory actuator 952 has inside a case 961 a coil 962, a movable weight 963, and a spring 966. These coil 962, movable weight 963, and spring 966 are the same as in the first example of the present embodiment. Further, in the figure, the vibratory member is provided in contact with the case 961 at a position facing the coil 962 across the case 961.

[0394] Next, FIG. 76 is a view illustrating the circuit configuration for applying a drive signal to the coil 962. The oscillator 974 shown in the figure is the same as in the second example of the present embodiment, so an explanation will be omitted. The control circuit 981 controls the switching of the switches SW1 and SW2 at two locations in the switch circuit 982. The control circuit 981 monitors the drive signal generated from the oscillator 974 (see FIG. 73) and, as shown in FIG. 77, outputs a CTRL signal that becomes the "Hi" level for exactly the period T2 during which the drive signal is generated from the oscillator 974. The switches SW1 and SW2 of the switch circuit 982 connect the oscillator 974 and the coil 962 when the CTRL signal supplied from the control circuit 981 is the "Hi" level. Therefore, while the CTRL signal is the "Hi" level, the drive signal is applied from the oscillator 974 to the coil 962 and the movable weight 963 reciprocates.

[0395] As opposed to this, when the CTRL signal supplied from the control circuit 981 becomes the "Low" level, that is, when application of the drive signal from the oscillator 974 to the coil 962 is stopped, the switches SW1 and SW2 of the switch circuit 982 switch the connection points as shown in FIG. 76 and short-circuit the coil 962. Therefore, due to the electromagnetic braking action, the reciprocation of the movable weight 963 can be quickly made stopped when stopping application of the drive signal. Accordingly, similar effects to the first example of the above embodiment are exhibited.

[0396] If using the oscillatory actuators 950 to 952 shown in the first example to the third example of the present embodiment explained above as vibration generators of the electronic devices in the first to twelfth embodiments, it is possible to more suitably control the vibration given to the user.

[0397] The reason is that, first, these oscillatory actuators 950 to 952 are provided with brake mechanisms. Therefore, it is possible to clearly give the user a "click" or other operation feeling where the strength of the vibration has to be clearly differentiated in a short time.

[0398] Second, these oscillatory actuators 950 to 952 are linear oscillatory actuators, so the directional accuracy of the vibration generated is high. Further, third, these oscillatory actuators 950 to 952 house the coil 962 and the movable weight 963 inside the case 961 sealed as a magnetic shield, so there is no effect of magnetic force from the surrounding electronic components etc. Accordingly, there is no deviation in direction of vibration generated by the oscillatory actuators 950 to 952 and no distortion of the shape of amplification of the vibration. Due to the above second and third advantages, the vibration generated by the oscillatory actuators 950 to 952 can be more finely controlled. Accordingly, it is possible to give the user a pressing feeling or a "click" feeling when the touch panel is touched or when a thin operation key is pressed. Further, the oscillatory actuators 950 to 952 never cause surrounding electronic components etc. to malfunction due to their magnetic force.

[0399] Fourth, these oscillatory actuators 950 to 952 are integrally packaged. Therefore, compared with when dividing the members of the oscillatory actuator, first of all there is almost never a problem in the mounting accuracy of the permanent magnet and the coil. Further, there is resistance to deterioration of the accuracy of mounting of the permanent magnet and coil due to aging. Accordingly, it is possible to cause the oscillatory actuators 950 to 952 to generate vibration by a stable accuracy. Further, assembly into an electronic device is easy. Further, even when the electronic device body or housing or other support member for supporting the vibratory member where the oscillatory actuators 950 to 952 are placed (for example, the touch panel or the liquid crystal display panel) is not firmly fixed or when the mass of the support member is not sufficiently large compared with the vibratory member, the oscillatory actuators 950 to 952 can give a sufficiently large vibration to the vibratory member. This is suitable for use for a light weight electronic device or portable electronic device.

[0400] Fifth, in the oscillatory actuators 950 to 952, since an audible band audio signal is applied to the coil 962, it is also possible to utilize the oscillatory actuators 950 to 952 as sound sources. If it is possible to make dual use of vibration generators and sound sources in this way, it is possible to greatly reduce the installation space of components in a small sized electronic device.

[0401] Note that the oscillatory actuators 950 to 952 shown in the first example to third example of the present embodiment are sealed by the case 115a having an anti-magnetic effect, but they may also not be sealed by the case 961. Further, the spring 966 supporting the movable weight 963 may be directly connected to the vibratory member and not to the case 961.

[0402] [N: Modifications]

[0403] Above, embodiments of the present invention were explained, but the embodiments are in the end only illustrations. Various modifications are possible within a range not out of the gist of the present invention. The following may be considered as embodiments.

[0404] [Modification 1]

[0405] In the first embodiment, the memory 112 stores a plurality of types of waveform data. The CPU 113 may read the waveform data designated by the operation input from the user in advance and drive the oscillatory actuator 115.